

1962 MAGNETIC DECLINATION OF SOUTH EDGE OF MAP RANGES FROM 16° TO 19°45' EAST

OPEN FILE MAP

INTRODUCTION

This is a preliminary report of geologic investigations in the lower Yukon-Norton Sound region, Alaska. It is based upon information obtained on a bost traverse of the lower Yukon in 1960 and by use of a helicopter in 1961. The study of vertical sirphotos yielded much information which was useful in guiding the field work and compiling Fossil identifications are by Ralph W. Imlay, David L. Jones, and

Jack A. Wolfe. of the U.S. Geological Survey.

Bedded rocks ranging in age from Paleozoic to late Cenozoic crop out widely in the eastern half of the mapped area and at a few places farther west where thick unconsolidated deposits of Quaternary age cover most of the bedrock. For mapping purposes the bedded strata are divided into five units. These units are primarily lithologic rather than stratigraphic because at the present stage of investigation it is not possible to correlate some of the strata with much assurance.

The rocks of unit e crop out in the vicinity of Marshall and extend eastward beyond the limits of the area mapped for this report. They consist of massive greenstone formed by the alteration of mafic volcanic rocks which is interbedded with chert; quartzite, pebble conglomerate, graywacke, dark argillitic rocks, and limestone. Between Marshall and the Kuyukutuk River and in the vicinity of Mt. Okumiat the unit is intruded by a large stock of biotite granite and numerous small bodies of dacite and rhyolite. In the vicinity of the intrusive bodies the rocks of unit e are metamorphosed to epidote-bearing amphibolite, quartz-biotite-muscovite schist, and chlorite-talc schist. The thickness and stratigraphic sequence of the unit is not known because the strata are compressed into tight folds and broken by many faults.

No fossils were found in these rocks in the area covered by this report but they are assumed to be of Permian age because they are in part lithologically similar to and strike toward fossiliferous limestone of Permian age a few miles farther east. They were mapped as Carboniferous by Harrington (1918. p. 23-26, pl. 3) who also correlated them with the rocks of Permian age which crop out farther up the Yukon.

Unit d crops out near the east edge of the area mapped for this report from the Yukon River northward, in the valley of the Chuilnek River, and south of Norton Sound in the vicinity of the Pastolik River. The strate consist of basalt, andesite, and trachyte lava flows, tuffs, breccia, volcanic wacke, and minor amounts of interbedded limestone and argillaceous sediments. At least 10,000 feet of these rocks crop out along the Yukon above and below Ohogamut Village. Four small collections of fossils were obtained from these strata north of Ohogamut David L. Jones reports that one collection consists of pelecypods (Buchia crassicolis or sublaevis of Early Cretaceous (Neocomian) age. The other collections consist of ammonite fragments and belemnites which Ralph W. Imlay reports are probably of Jurassic age. No fossils or sedimentary rocks have been found associated with the volcanic rocks in the valley of the Chuilnak River or south of Norton Sound near the Pastolik River. The volcanic rocks in both of these areas are tentatively correlated with the fossiliferous strata on the Yukon, on the basis of lithologic simi-

Unit c is made up of sedimentary rocks that crop out at intervals along the Yukon from the vicinity of Pilot Station to Mountain Village and extend northeast parallel to the Andreafsky and Chuilnak Rivers. The unit also crops out on Cape Romanzof and forms most of the Kusilvak

The rocks consist of medium- to dark-gray sandstone interbedded with equal or greater amounts of siltatone. Locally the -: **tone is quite shaly. Conglomeratic strata were noted in only one place. Most of the sandstone is graywacke consisting of mixtures of angular and rounded clasts in a fine-grained matrix. It commonly contains carbonized plant trash and locally shows faint ripple marks, small-scale crossbedding, and other evidence of near-shore, shallow water deposition. Several collections of fossils consisting of mollusca and plants were obtained from these rocks. The fossil plants, which were obtained on the Yukon about a mile below Pilot Station and at three places on the East Fork of Andreafsky River, were examined by Jack A. Wolfe, who reports that they are late Early or early Late Cretaceous (Albien or Cenomanian) age. Two collections of pelecypods were obtained near the mouth of the Andreafsky River, a third on a ridge crest about 5 miles northwest of Pilot Station, and three others on the East Fork of Andraefsky River. The collections were examined by David L. Jones who reports that the first two collections are of late Early Cretaceous (Albian) age; the remaining four collections consist of fresh water forms (Unio sp.) which are not diagnostic of age. However, the collections of fresh water forms were obtained from the same strata s as the fossil plants identified by Wolfe as late Early Cretaceous or early Late Cretaceous age. As all fossil collections were obtained

taceous age as well as Albian age. North of the Yukon River the rocks of unit c can be subdivided into three groups of strate on the basis of whether the sandstones are age of these three groups of strata is uncertain because the rocks are highly deformed and poorly exposed. The three groups of strata form seven fairly well defined belts of rock that trend northeastward parallel to the regional strike. Some of the belta extend from the Yukon northeastward beyond the area mapped for this report; others appear to pinch out in a distance of 15 to 20 miles. The stratigraphic and structural relationships of the belts are uncertain. Some of them may be separated by faults; others may crop out in the axis or on tha limbs of gently plunging folds. The belts are not shown on the small-scale base map because it lacks sufficient detail to locate them accurately. Laumontite-bearing sandstone characterizes a broad belt of rocks that splits into two belts about 20 miles north of the Yukon. The laumontite sandstone is interbedded with lesser amounts of noncalcareous gray sandstone, and with equal or greater amounts of siltatone and shale. It is medium to dark gray and blotched with light- to mediumgray spots. In some strata the light-colored spots or blotches are surrounded by larger areas of darker colored rock and the rock has a speckled appearance. Elsewhere the light-colored areas appear to have joined and make up most or all of the rock with little or none of the darker rock left. X-ray and thin-section analyses show that both the light and dark-colored parts contain a large amount of the calcic zeolite laumontite as the chief cementing material. The fact that the lightcolored blotches are commonly spherical or ovoid probably reflects the tendency of laumontite to crystallize as spherical clusters of radiating

Noncalcareous, dark-gray, and greenish-gray sandstones characterize two of the belts. The sandstone is interhedded with equal or greater amounts of siltstone and, locally, with small amounts of calcareous sandstone. The noncalcareous sandstone is well indurated and occurs in beds ranging in thickness from an inch to more than a foot. Locally. as downstream from Pilot Station, sandstone forms massive beds several

The fossil plants and mollusca found in unit c are associated with the noncalcareous sandstones. They indicate that the rocks were deposited under near-shore marine and nonmarine conditions.

Highly calcareous gray sandstone interbedded with equal or greater amounts of noncalcareous siltstone comprise three of the belts. Locally the calcareous sandstones grade into sandy limestone. At least two 10to 20-foot beds of cobble conglomerate are interlayered with the thinbedded calcareous sandstone that forms Point Romanzof on the south shore of Norton Sound. Except for shale-chip conglomerate and a few thin layers of pebble grit, these are the only conglomeratic rocks noted in unit c. The calcareous rocks weather various shades of brown and characteristically split parallel to the bedding into sheets less than 2 inches thick. Hills and ridges formed on the calcareous rocks are generally smoothly rounded and surmounted by numerous isolated conical

West of the Yukon River the strata of unit c crop out in the Kusilvak Mountains and on Cape Romanzof. In both areas the rocks are baked and altered to hornfels by bodies of intrusive rocks. On Cape Romanzof where the rocks are highly altered, no calcareous sandstones were noted. In the Kusilvak Mountains, where the rocks are generally less altered, both calcareous and noncalcareous strata were noted. No laumontite-bearing sandstone was noted at either place. It is probable that the sedimentary rocks west of the Yukon ara part of the westernmost belt of noncalcareous rocks which locally includes some calcareous sandstone.

Unit b consists of moderately deformed andesite and baselt flows that crop out near the headwaters of the Nageethluck Rivar. The rocks are mostly porphyritic dark gray or black and are commonly vesicular and amygdaloidal. Some of the flows are propylitized but they are less altered than the volcanic rocks in unit d. The olivine noted in one flow is partly altered to serpentine; the glassy matrix in some of the flows is somewhat devitrified. Many of the flows show a well-developed platy parting parallel to the flow planes, which commonly dip 10° to 20°

The flows are thought to be of Tertiary or possibly Late Cretaceous age because they are more deformed and altered than flows of Quaternary ge and less deformed and altered than rocks mapped as unit d of MasoUnit a consiste largely of rison al and vesicular olivins baselt which out on Stuart Islanuth shore of Norton Sound, at the Mission on the

south shore of Norton Sound, at of Mt. Chusiat, and at my plot the flows are closely associated poorly consolidated, gray and ye The source of many individual vents which are cone-shaped and the surrounding terrane. Crater depressions to steep-sided holes appear to be between 10 and 30 pore than 10 miles long.

I flows and associated to because they are undeformed and over a considerable period of the younger flows retain their origin of vegetation except for I few 1 sected, covered with vegetation, of the older flows may be broken faults.

Intrusive igneous rocks are highly granitic and rhyolitic but include a few dikes and sills of manifely granitic and rhyolitic but include a few dikes and sills of manifely granitic and rhyolitic but included by the igneous rocks, so the of them. Strate ranging in age from truded by the igneous rocks, so the of them. at least, are so young as Late Cretaceous of Tertiary. The in conglomerate of Cretaceous age that granitic bodies may be of preference or very Early Cretaceous age. The chief areas of intrusing activity are the Askinuk Mountains. Kusilvak Mountains, Mt. Okumiat, kutuk River, west of Kako Creek. kutuk River, west of Kako Creek, he Wolf Creek Mountains, and near the headwaters of the East Fork of Ar reafsky River. Several small bodies of intrusive rocks have been omit ed from the geologic map owing to

headwaters of the East fork of Americal Ry River. Several small could be of intrusive rocks have been omit ed from the geologic map owing to their size.

Preliminary study of the intrusive rocks indicates that they are of two general groups. The first group consists of gray, medium-grained biotite grante and hornblende gr hodiorite. The second group consists of fine-grained, porphyritic gray rhyolite and rhyodacite. The Askinuk Mountains and the slopes of Filcher Mountain are formed on granitic rocks of the first group. The to of Filcher Mountain consists of contact-metamorphosed greenstones. The Kusilvek Mountains are formed chiefly on baked, slightly metamo phosed seddmentary rocks of unit c, which are intruded by fine-grains, porphyritic rhyolite and dacite dikes and sills. The purphyritic rocks are probably apophyses from an underlying granite body, became the widespread baking of the sedimentary rocks cannot be attribute to the porphyritic rocks which crop out mostly near the north side of the mountains.

The Askinuk Mountains consist mostly of medium-to coarse-grained gray granediorite. Locally the granddorite contains dark-gray fine-grained inclusions or segregation and is cut by fine-grained gray porphyritic dikes 10 to 20 feet i.ick. The dikes spear to be dacite. The granddorite and associated dikes intrude interbedded sandstone and siltstone of Cretaceous age intic. The dikes and siltstone of Cretaceous age intic. The dikes and siltstone of Cretaceous age intic. The form most of Cape Romanzof. The sedimentary rocks

Intrusive rocks near the upper part of the East Fork of Andreafsky River are chiefly fine-grained gray porphyritic rhyolite. rhyodacite. and chyodacite form numeroum sheet-like intrusive bodies which range in thickness from a few few to many hundreds of feet. Some of the thicker sheets extend 10 to implicate the first of the sheets appear to widen into dome-shaped dodies a mile or more in diameter. The country rocks, chiefly clearsous sandatone and shale, show little or no metamorphism nea

lower slopes of the ridges.

The rhyolite consists of a prococrystalline matrix of quarts and feldspar in which crystals of aprite. zoisite, pyrite, and, locally, specular hematite are embedded. The matrix is largely altered to scaly, micaceous minerals. A few relic feldspar phenocrysts are discernible

under the microscope.

The fact that this intrusive body of rhyolite is surrounded by a metamorphic sursole at least a mic wide and that essentially no metamorphic effects were noted mean to large rhyolite bodies on the East Fork of the Andreafsky River is mewhat anamolous. Possibly the rhyolite in the Wolf Creek Mountains is a felsic border facies of an underlying granite body which is not appeared at the present erosion level.

Dacite and rhyodscite fragments are the chief constituents of patches of frost rubble over an of the Kuyukutuk River. On the single intrusive body but they may form several small bodies.

Most of the rocks are light to medium gray, fine grained, and porphyritic. The felsic matrix appears to be largely orthoclase and quarts, the phenocrysts see chief y plagicclase (oligoclase and andesine), biotite and hornblende. Rounded, embayed quarts phenocrysts occur in some of the rocks, but others contain no modal quarts and are probably diorite. In general the rocks of this intrusive body do not appear to be as much altered as they are in the vicinity of Mt. Okumiat except along the west edge of the body were the rocks are silicified and heavily iron-stained.

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The intrusive rocks are born red on the west by metamorphosed rocks of late Paleozoic age (unit e) and on the east by metamorphosed rocks of Mesozoic age (unit d). The metamorphosed Mesozoic rocks are chiefly porphyroblastic hornfels developed from siltstone and volcanic wacks. The Paleozoic rocks west of the latrusive body are chiefly mafic lava flows and quartzite. Near the contact the lava flows are altered to zoisite or clinozoisite amphibolite and the quartzite has porphyroblastic orthoclase. The lava flows of possible Late Cretaceous or Tertiary age (unit b) that crop out north of the intrusive rocks do not appear to be altered. The nature of their contact with the intrusive rocks is not known because it is concealed by Illuvial cover.

known because it is concealed by lluvial cover.

In the vicinity of Mt. Okumi t the intrusive rocks consist of numerous dikes that range in this ness from 5 feet to several hundred feet. They are not shown on the size. The attitude of the dikes a poorly known because they crop out only as frost rubble, but they so ear to trend generally east-west and

reliminary study of the direct indicate that they are hydro-thermally altered. They are gray fine to medium grained, and commonly have a sugary appearance. The or ginal minerals are partly or entirely replaced by sericite, chlorite, arbonate, and quartz. The original composition of the rocks is uncertain but most of them are probably altered granite or granodiorite perphyry. The dikes intrude granaton graywacke, conglomerate, and argillitic rocks of unit e, all of which are silicified, recrystallized, and locally, pyritized. The placer gold deposits in the vicinity of Mt. O umiat were probably derived from these

A moderate-sized intrusive body west of Kako Creek consists of porphyritic rocks similar to but less altered than the dike rocks in the vicinity of Mt. Okumiat. Much of the rock is a granoblastic mossic of quartz and orthoclass with abundant phenocrysts of plagicolase and less abundant phenocrysts of green how blende and rounded resorbed quartz. Epidote, chlorite, sericite, and phene are common secondary minerals.

A metamorphic sureole of based and recrystallized greenstones at least one-half mile wide surrounds the intrusive body. No metallic minerals other than magnetite were noted in the intrusive or metamorphi rocks. However the placer gold more which was formerly operated at the east end of the intrusive body shows that some of the rocks are

Surficial deposits comprise unconsolidated deposits of silt. sand, and gravel of Quaternary age. They include older terrace gravels and silt of Pleistocene age and Recent flood-plain alluvium and beach de-

Unconsolidated deposits are seat extensively developed along the south shore of Norton Sound from St. Michael southwestward and wast and south of the Yukon River. North the Yukon the deposits are best daveloped near the mouths of large tributary streams such as the Chuilmuk and Andreafsky Rivers.

The deposits contain quantities of brown peat in layers that are commonly several feet thick. Much of the peat and most of the older silt deposits are permanently frozen. The thickness of the deposits varies from a few inches on bedrock hills to many hundreds of feet far out on the

In some areas the finer grained deposits have been reworked by wind action. Extensive deposits of windblown silt occur a few miles south of the Yukon. South and west of the town of Russian Mission windblown silt mantles the hills and ridges to a neight of at least 500 feet above the level of the Yukon River.

Harrington, G. L., 1918, The Anvik-Andreafski region, Alaska: U.S. Geol. Survey Bull. 683, 70 p.